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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

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(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TP102212/ER	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/FI 2003/000548	International filing date (day/month/year) 11.07.2003	Priority date (day/month/year) 12.07.2002
International Patent Classification (IPC) or national classification and IPC A01G 23/091		
Applicant Plustech Oy et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☒ (sent to the applicant and to the International Bureau) a total of 7 sheets, as follows:

☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand 12.02.2004	Date of completion of this report 11.10.2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Kristoffer Ogebjer/EK Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI 2003/000548

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- ☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 2, 4 - 9 as originally filed/furnished
- pages* 1, 3 received by this Authority on 11.08.2004
- pages* _____ received by this Authority on _____
- ☒ the claims:
- pages _____ as originally filed/furnished
- pages* _____ as amended (together with any statement) under Article 19
- pages* 11 - 15 received by this Authority on 11.08.2004
- pages* _____ received by this Authority on _____
- ☒ the drawings:
- pages 1 as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-20</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-15, 19</u>	YES
	Claims	<u>16-18, 20</u>	NO
Industrial applicability (IA)	Claims	<u>1-20</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

D1: SE, C2, 517665

The object of the invention is to prevent the swinging movement of a saw chain breaking in connection with sawing.

D1 discloses a safety device with a protective wall (31), which is capable of receiving the movement of the tail of a broken saw chain and to guide it into the desired direction. Concentric motors (32) are able to hold the wall to a location during sawing (p. 3, line 6-11).

The invention according to claims 1-15, 19 differs from what D1 discloses in the matter that the wall is fastened to the guide bar in order to change position according to the guide bar. The cited document represents the general state of the art. The invention defined in claims 1-15, 19 is not disclosed by this document.

The cited prior art does not give any indication that would lead a person skilled in the art to the claimed device, apparatus or method. Therefore, the claimed invention is, not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1-15 and 19 is novel and is considered to involve an inventive step. The invention is industrially applicable.

The invention according to claims 16-18 and 20 only differs from what is disclosed in D1 in the matter of the wall being coated in rubber, the size of the sector area that is covered and that the wall is fastened. These details are obvious to a person skilled in the art and do not involve an inventive step in order to implement in an arrangement of D1. The invention according to claims 16-18 and 20 is novel, industrial applicable but lacks an inventive step from what is stated in D1.

Claims:

1. A safety device for a breaking saw chain, **characterized** in that the safety device (7) comprises a protective wall (9) positioned in the vicinity of a drive gear (4) in such a manner that it is capable of receiving the movement of the tail of the broken saw chain and to guide said tail in a controlled manner with the rest of the saw chain into the desired direction, wherein at the same time the strong swinging movement of said tail is prevented, and said protective wall is fastened to movable members (3) that are arranged to hold the protective wall (9) in the correct location during sawing in relation to the saw chain (6) whose incoming direction (B) varies during the operation.

2. The safety device according to claim 1, **characterized** in that the protective wall (9) is fastened to a rotating holder (3) to which the guide bar (12) around which the chain (6) rotates, is arranged to be fastened.

3. A method for preventing the swinging movement of a saw chain (6) breaking during sawing, and the tail of said saw chain in a safe manner, wherein the method comprises the steps of:

- passing the saw chain (6) around a guide bar (12) by means of a drive gear (4) that is positioned on one end of the guide bar, wherein according to the normal operation the saw chain (6) moves from the guide bar (12) at the drive gear (4) and rotates back on top of the drive gear (4),
- conducting the sawing by rotating the guide bar (12) around a first rotation axis (A),

characterized by

- moving the protective wall (9) during sawing in phase with the guide bar (12) to maintain their mutual position,
- wherein a protective wall (9) is used, which is positioned in such a manner that it is capable of receiving the saw chain (6) breaking during sawing as well as the tail of said saw

chain, which tend to continue their movement past the drive gear (4), and guiding them to the desired direction.

4. The method according to claim 3, **characterized** by conducting the movement in such a manner that the protective wall (9) is rotated around said first rotation axis (A) together with the guide bar (12).

5. The method according to claim 3 or 4, **characterized** by guiding the broken saw chain by means of the protective wall (9) that is located within a distance from the drive gear (4), curving in the same direction with the drive gear (4).

6. A sawing apparatus and a safety system, said sawing apparatus (1) comprising:

- a frame part (2) for fastening,
- a holder (3) for the guide bar that is intended for fastening of the guide bar (12) and arranged to rotate around a first rotation axis (A) with respect to said frame part to perform the sawing movement,
- means (4, 5) for driving the saw chain (6) and performing the sawing, and
- wherein said means comprise a drive gear (4) that is positioned on one end of the guide bar (12) and moves the saw chain (6) with its force around the guide bar (12),

characterized in that the safety system comprises:

- a protective wall (9), which is positioned in such a manner that it is capable of receiving the saw chain (6) that has broken during sawing as well as the tail of said saw chain, which tend to continue their movement past the drive gear (4), and guiding them to the desired direction, and
- means for moving the protective wall (9) in phase with the guide bar holder (3) and for maintaining their mutual position.

7. The sawing apparatus and safety system according to claim 6, **characterized** in that the protective wall (9) is positioned on that side of the drive gear (4) on which the saw chain (6) moves in accordance with normal operation from the guide bar (12) to the drive gear (4) and rotates back on top of the drive gear (4).

8. The sawing apparatus and safety system according to claim 6 or 7, **characterized** in that the distance of the protective wall (9) from the drive gear (4) is mostly substantially constant.

9. The sawing apparatus and safety system according to any of the claims 6 to 8, **characterized** in that on the first end of the protective wall (9) that is located on the side of the incoming saw chain (6), there is a wall part (10) curving away from the drive gear (4) that is intended to guide the broken chain (6) between the drive gear (4) and the protective wall (9).

10. The sawing apparatus and safety system according to any of the claims claim 6 to 9, **characterized** in that the protective wall (9) substantially covers a sector area of 100° to 120°, whose central point is the first rotation axis (A).

11. The sawing apparatus and safety system according to any of the claims claim 6 to 10, **characterized** in that the protective wall (9) is fastened to the guide bar holder (3) which thus at the same time forms said means intended for moving the protective wall (9).

12. The sawing apparatus and safety system according to any of the claims 6 to 10, **characterized** in that said means that are intended for moving the protective wall (9) are composed of such a part of the sawing apparatus that rotates in phase with the guide bar (12) around the first rotation axis (A) so that the location of the protective wall (9) in relation to the saw chain (6) would remain the same.

13. The sawing apparatus and safety system according to any of the claims claim 6 to 11, **characterized** in that the protective wall (9) is po-

sitioned substantially perpendicularly in relation to the plane that coincides with the guide bar (12) and the moving saw chain (6).

14. The sawing apparatus and safety system according to claim 13, **characterized** in that the protective wall (9) is fastened to such a surface of the holder (3) of the guide bar which is substantially parallel to said plane.

15. The sawing apparatus and safety system according to any of the claims 6 to 14, **characterized** in that the protective wall (9) has a substantially L-shaped or U-shaped cross section.

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The Swedish Patent Office
PCT International Application

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PCT/FI2003/060548
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Sawing device and its safety system for precaution of a breaking saw chain

The invention relates to a method in a sawing apparatus of a forest machine for preventing the whipping movement of a saw chain breaking during sawing, according to the preamble of claim 1. The invention relates to a sawing apparatus of a forest machine, according to the preamble of claim 5. The invention relates to a safety device for a breaking saw chain according to the preamble of claim 16.

In forest machines, a harvester head is typically used, which is arranged to perform the felling of a growing tree and the manipulation of the tree after the felling at the forest work place. When the harvester head is fastened to the end of a boom assembly in a forest machine, its task is to grip an upright standing tree and cut it, allow the movement of the tree substantially onto the horizontal plane in a controlled manner and to delimb and cut the tree. The tree trunk is fed through the delimbing means of the harvester head substantially on horizontal plane in such a manner that the travel of the tree is stopped at intervals, wherein the tree trunk is cut at a suitable point by means of sawing. The feeding means typically comprise a pair of feeding wheels between which the tree trunk is positioned. The delimbing means comprise one or several pairs of knives, which are positioned around the tree trunk and surround the tree trunk as well as possible. Typically the entire tree, excluding the relatively thin top part, is manipulated in this way.

The saw assembly performing the sawing is mounted substantially in the shield of a saw box. An advantageous saw assembly comprises a frame, a saw motor, a drive gear, a guide bar, a saw chain, a holder for the guide bar and a member for feeding the guide bar outward and inward. The saw motor is arranged to drive the drive gear and during the sawing process the saw chain rotates around the turnable guide bar, driven by the drive gear. The holder of the guide bar is arranged turnable and the outward and inward feeding member is arranged to move the guide bar. In one embodiment the outward and inward feeding member comprises a hydraulic cylinder installed in the saw

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a forwarder are working, it is not always possible to ensure the minimum safety distance.

It is an aim of the present invention to eliminate the above-presented drawbacks relating to the safety and to the loosening of the parts of the saw chain. The breaking saw chain may also damage the saw box or sawing apparatus, which problem the invention aims at solving. One specific aim is to entirely eliminate such a possibility and situation that parts would be loosened from a broken saw chain, wherein the loosened parts or strong swinging movement of the chain would not cause danger or other damage.

It is a central principle of the invention to prevent the strong swinging movement of the tail of a broken saw chain as well as its return movement, which movement also makes the parts of the saw chain loosen more easily from the broken chain.

The method according to the invention is characterized in what will be presented in the characterizing part of claim 1. The sawing apparatus of a forest machine according to the invention is characterized in what will be presented in the characterizing part of claim 5. The safety device according to the invention are characterized in what will be presented in the characterizing part of claim 16.

Experiments have shown that the loosening occurs for example as a result of such a situation where a cutting tooth of the saw chain is stuck to a tree or meets an obstacle, for example a metal nail. However, the drive gear of the strong saw motor that is in practice a cogged chain wheel, continues to draw the saw chain and tenses the saw chain that yields by stretching slightly, and finally breaks at the point that was stuck, or at the point located between the obstacle and the drive gear. At the sawing point the movement of the saw chain is directed towards the drive gear and in a normal situation it at the same time clings to the tree, thus enabling the sawing. After the breaking the saw chain continues its movement in the direction of traction, substantially in the direction parallel to the lower edge of the guide bar, and finally rectilinearly past the drive gear as well. The rotating drive gear that is still